What is claimed is:

1. A permanent magnet in which the magnetization direction varies in three dimensions with location to optimize a desired magnetic field property in a selected direction at a selected point.

2. The permanent magnet in accordance with claim 1 wherein the desired magnetic field property is selected from transverse magnetic field, axial magnetic field, axial gradient of the transverse magnetic field, transverse gradient of the transverse magnetic field, axis gradient of the axial magnetic field, transverse gradient of the axial magnetic field, the product of the transverse magnetic field and the transverse gradient of the transverse magnetic field, the product of the transverse magnetic field and the axial gradient of the transverse magnetic field, the product of the axial magnetic field and the transverse gradient of the axial magnetic field, or the product of the axial magnetic field and the axial gradient of the axial magnetic field.

3. A permanent magnet in which the magnetization direction varies in three dimensions to restrict an undesired magnetic field property in a selected direction at a selected point

4. The permanent magnet in accordance with claim 3 wherein the undesired magnetic field property is selected from transverse magnetic field, axial magnetic field, axial gradient of the transverse magnetic field, transverse gradient of the transverse magnetic field, axis gradient of the axial magnetic field, transverse gradient of the axial magnetic field, the product of the transverse magnetic field and the transverse gradient of the transverse magnetic field, the product of the transverse magnetic field and the axial gradient of the transverse magnetic field, the product of the

axial magnetic field and the transverse gradient of the axial magnetic field, or the product of the axial magnetic field and the axial gradient of the axial magnetic field.

5. A permanent magnet in which the magnetization direction varies in three dimensions with location to optimize a desired magnetic field property in a selected direction at a selected point.

6. The permanent magnet in accordance with claim 5 wherein the desired magnetic field property is selected from transverse magnetic field, axial magnetic field, axial gradient of the transverse magnetic field, transverse gradient of the transverse magnetic field, axis gradient of the axial magnetic field, transverse gradient of the axial magnetic field, the product of the transverse magnetic field and the transverse gradient of the transverse magnetic field, the product of the transverse magnetic field and the axial gradient of the transverse magnetic field, the product of the axial magnetic field and the transverse gradient of the axial magnetic field, or the product of the axial magnetic field and the axial gradient of the axial magnetic field.

7. A permanent magnet in which the magnetization direction varies in three dimensions to restrict an undesired magnetic field property in a selected direction at a selected point.

8. The permanent magnet in accordance with claim 3 wherein the undesired magnetic field property is selected from transverse magnetic field, axial magnetic field, axial gradient of the transverse magnetic field, transverse gradient of the transverse magnetic field, axis gradient of the axial magnetic field, transverse gradient of the axial magnetic field, the product of the transverse magnetic field and the transverse gradient of the transverse magnetic field, the product of the transverse magnetic field and the axial gradient of the transverse magnetic field, the product of the

axial magnetic field and the transverse gradient of the axial magnetic field, or the product of the axial magnetic field and the axial gradient of the axial magnetic field.

9. A method of performing a medical procedure using the magnet of claim1 to project magnetic field into a patient to control a magnetic medical element inside the patient.

10. A method of performing a medical procedure using the magnet of claim 3 to project a magnetic field into a patient to control a magnetic medical element inside the patient.

11. A method of making a permanent magnet in which the magnetization direction varies with location to optimize a desired magnetic field property at a selected point in a selected direction, the method comprising: determining the desired shape, providing a blank of permanent magnetic material in the desired shape, and magnetizing the magnet to have a magnetization direction that varies in three dimensions so that the magnetization at each location in the magnet is in the direction that substantially optimizes the desired magnetic field property at a selected point in the selected direction.

12. A method of making a permanent magnet in which the magnetization direction varies with location to restrict an undesired magnetic field property at a selected point in a selected direction, the method comprising: determining the desired shape, providing a blank of permanent magnetic material in the desired shape, and magnetizing the magnet to have a magnetization direction that varies in three dimensions so that the magnetization at each location in the magnet is in the direction that substantially restricts the undesired magnetic field property at a selected point in the selected direction.

13. A method of making a permanent magnet in which the magnetization direction varies with location to optimize a desired magnetic field property at a selected point in a selected

direction, the method comprising: determining the desired shape, providing a blank of permanent magnetic material in the desired shape, and magnetizing the magnet to have a magnetization direction that varies in two dimensions so that the magnetization at each location in the magnet is in the direction that substantially optimizes the desired magnetic field property at a selected point in the selected direction.

14. A method of making a permanent magnet in which the magnetization direction varies with location to restrict an undesired magnetic field property at a selected point in a selected direction, the method comprising: determining the desired shape, providing a blank of permanent magnetic material in the desired shape, and magnetizing the magnet to have a magnetization direction that varies in two dimensions so that the magnetization at each location in the magnet is in the direction that substantially restricts the undesired magnetic field property at a selected point in the selected direction.

15. A method of making a permanent magnet in which the magnetization direction varies with location to optimize a desired magnetic field property at a selected point in a selected direction, the method comprising: determining the desired shape, assembling a plurality of permanent magnet segments into a shape substantially conforming to the desired shape, the magnetization direction of each permanent magnet segment varying in three dimensions so that the magnetization direction of each permanent magnet segment is in the direction that substantially optimizes the desired magnetic field property at a selected point in the selected direction.

16. A method of making a permanent magnet in which the magnetization direction varies with location to restrict an undesired magnetic field property at a selected point in a

selected direction, the method comprising determining the desired shape, assembling a plurality of permanent magnet segments into a shape substantially conforming to the desired shape, the magnetization direction of each permanent magnet segment varying in three dimensions so that the magnetization direction of each permanent magnet segment is in the direction that substantially restricts the undesired magnetic field property at a selected point in the selected direction.

17. A method of making a permanent magnet in which the magnetization direction varies with location to optimize a desired magnetic field property at a selected point in a selected direction, the method comprising: determining the desired shape, assembling a plurality of permanent magnet segments into a shape substantially conforming to the desired shape, the magnetization direction of each permanent magnet segment varying in two dimensions so that the magnetization direction of each permanent magnet segment is in the direction that substantially optimizes the desired magnetic field property at a selected point in the selected direction.

18. A method of making a permanent magnet in which the magnetization direction varies with location to restrict an undesired magnetic field property at a selected point in a selected direction, the method comprising determining the desired shape, assembling a plurality of permanent magnet segments into a shape substantially conforming to the desired shape, the magnetization direction of each permanent magnet segment varying in two dimensions so that the magnetization direction of each permanent magnet segment is in the direction that substantially restricts the undesired magnetic field property at a selected point in the selected direction.

19. The method according to claim 18 wherein at least a portion of the surface of the magnet conforms to a surface of constant contribution to the desired magnetic field property at the selected location.

20. The method according to claim 18 wherein the direction of magnetization throughout each permanent magnet segment is constant.

21. The method according to claim 20 wherein the direction of magnetization throughout each permanent magnet segment is the direction which, at the center of mass of the segment, provides the maximum contribution to the desired property.

22. The method according to claim 20 wherein the direction of magnetization throughout each permanent magnet segment is the direction which, at the effective magnet center, provides the maximum contribution to the desired property.

23. The method according to claim 20 wherein the size and position of the permanent magnet segments is selected so that the difference in the direction of magnetization direction between adjacent magnet segments is less than about 45°.

24. The method according to claim 23 wherein the size and position of the permanent magnet segments is selected so that the difference in the direction of magnetization direction between adjacent magnet segments is less than about 30°.

25. The method according to claim 20 wherein the magnetization direction throughout each permanent magnet segment is not constant.

26. The method according to claim 20 wherein the desired magnetic field property is selected from transverse magnetic field, axial magnetic field, axial gradient of the transverse magnetic field, transverse gradient of the transverse magnetic field, axis gradient of the axial

magnetic field, transverse gradient of the axial magnetic field, the product of the transverse magnetic field and the transverse gradient of the transverse magnetic field, the product of the transverse magnetic field and the axial gradient of the transverse magnetic field, the product of the axial magnetic field and the transverse gradient of the axial magnetic field, or the product of the axial magnetic field and the axial gradient of the axial magnetic field.

27. The method according to claim 20 wherein the desired property is transverse magnetic field is transverse magnetic field, and the relationship between the magnetization and angle the angular position is given by equation (3).

28. A method of making a permanent magnet in which the magnetization direction varies to control a desired property of the magnetic field at a selected point;

determining the desired magnetization direction α as a function of θ the angle from the selected point to control the desired property of the magnetic field;

selecting a cross section for the magnet in a plane containing the selected direction

providing a magnetic material in substantially the selected cross section, in which the magnetization direction α, substantially conforms to the function at each θ.

29. The method according to claim 28 wherein the magnetic material is monolithic with a continuously variable magnetization direction.

30. The method according to claim 29 wherein the magnetic material comprises a plurality of discrete magnet segments, with the magnetization direction of each segment having a constant magnetization direction that substantially conforms to magnetization direction α as a function of θ through the magnet segment.